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(54) IMAGE FORMING DEVICE

(57) Abstract:

PROBLEM TO BE SOLVED: To obtain an excellent image free from the image defect by preventing the separation discharge or the abnormal discharge from occurring in primary transfer nip parts.

SOLUTION: This image forming device is, let respectively adopting elastic transfer blade in the plate shape 40, 41, 42 and 43, whose resistance is adjusted so as to become 1[times]10<sup>1</sup> to 1[times]10<sup>12</sup> [Omega]cm, as a primary transfer bias applying member which abut on the rear side of an intermediate transfer belt 5 in the primary transfer nip part N so as to bring the surface side of the belt 5 into contact with photosensitive drums 1a, 2a, 3a and 4a and apply the primary transfer bias onto the belt 5. In such a manner, an area where the electric field is effected by the primary bias in the vicinity the primary transfer nip part N is narrowed.

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CLAIMS

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## [Claim(s)]

[Claim 1] In the image formation equipment which imprints the primary toner image formed on image support to an endless-like middle imprint belt in the primary imprint sections, imprints the 2nd order of said toner image on this middle imprint belt to imprint material in the secondary imprint sections, and performs image formation in contact with the tooth-back side of said middle imprint belt, this middle imprint hair side of belt side is contacted to said image support in said primary imprint sections. It has a primary imprint bias impression member for impressing primary imprint bias to said middle imprint belt. Said primary imprint bias impression member Image formation equipment with which a volume resistivity is characterized by what consists of plate-like part material by which resistance adjustment was carried out, and which has elasticity, or a sheet-like member at 101-1012-ohmcm.

[Claim 2] The surface electrical resistance by the side of the tooth back of said middle imprint belt which contacts said primary imprint bias impression member is 108. Image formation equipment according to claim 1 characterized by what is been more than omega\*\*.

[Claim 3] Sequential formation of the toner image of two or more colors is carried out on said one image support, primary imprint bias is impressed to said primary imprint bias impression member in the primary imprint sections, and the primary toner image of said two or more colors is imprinted one by one on said middle imprint belt. Superposition, Image formation equipment according to claim 1 or 2 characterized by what the piled-up toner image of said two or more colors is put in block in the secondary imprint sections, and the 2nd order is imprinted for to imprint material.

[Claim 4] Said image support which supports the electrostatic latent image of the color of the arbitration according to image information on a front face, It has two or more image formation units equipped with a development means to develop said electrostatic latent image as a toner image, at least. Arrange said each image support of each of said image formation unit to a single tier, and said each image support is made to contact said middle imprint hair side of belt side side in the primary imprint sections, respectively. Impress primary imprint bias to said primary imprint bias impression member in said primary imprint sections of each of said image support, pile up the toner image of a different color formed in said each image support, respectively one by one on said middle imprint belt, and it is imprinted the 1st [ in all ] order. Image formation equipment according to claim 1 or 2 characterized by what the toner image of two or more colors piled up in the secondary imprint sections is put in block, and the 2nd order is imprinted for to imprint material.

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DETAILED DESCRIPTION

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## [Detailed Description of the Invention]

## [0001]

[Field of the Invention] This invention relates to image formation equipments, such as a copying machine which performs image formation with an electrophotography method, a printer, and facsimile.

## [0002]

[Description of the Prior Art] As two or more colors or the full color image formation equipment of an electrophotography method, it responds for every color, two or more photoconductor drums are arranged, and the image formation equipment of a configuration of making the toner image of each color formed on each photoconductor drum pile up mutually one by one on imprint material or a middle

imprint object, and forming a color picture is proposed.

[0003] As this kind of image formation equipment, as shown, for example in drawing 5, the photoconductor drums 1a, 2a, 3a, and 4a as image support are arranged at the single tier at four image formation units 1, 2, 3, and 4, respectively, and black, a Magenta, cyanogen, and the toner image of yellow are formed in each photoconductor drums 1a, 2a, 3a, and 4a, respectively.

[0004] As shown in each image formation units 1, 2, and 3 and 4 at drawing 6 (drawing 6 shows the image formation unit 1), the electrification machine 30, the aligner 31, and the 32 or primary developer imprint cleaning blade 34 are arranged around photoconductor drum 1a. Also in the image formation units 2, 3, and 4, it is the same configuration.

[0005] The primary imprint rollers 9, 10, 11, and 12 are in contact with each photoconductor drums 1a, 2a, 3a, and 4a of the image formation units 1, 2, 3, and 4 through the endless-like middle imprint belt 5, respectively in the primary imprint nip section N.

[0006] Each photoconductor drums 1a, 2a, 3a, and 4a are the OPC photo conductors of negative polarity in this conventional example. Elongation \*\*\*\*\* of the middle imprint belt 5 is carried out between the 6 or secondary driving roller imprint opposite roller 7 and the tension roller 8, and it rotates in the direction of an arrow head by the drive of a driving roller 6. As a middle imprint belt 5, what prepared the good resin layer of a mold-release characteristic on the substratum of resin films, such as 100-200 micrometers in thickness, about [ volume-resistivity 10<sup>11</sup>-10<sup>16</sup>ohmcm ] PVdF (polyvinylidene fluoride), a polyamide, polyimide, PET (polyethylene terephthalate), and a polycarbonate, and the rubber of 0.5-2mm thickness extent can be used.

[0007] Moreover, the electric discharge machine 17 and the secondary imprint cleaning blade 20 are installed in the outside of the middle imprint belt 5. The primary imprint bias power supply 13, 14, 15, and 16 is connected to the primary imprint rollers 9, 10, 11, and 12, respectively. The secondary imprint roller 18 by which the primary imprint bias power supply 19 was connected to the secondary imprint opposite roller 7 through the middle imprint belt 5 in the secondary imprint nip section M is contacted.

[0008] For an ASUKA C degree of hardness, 30-60 degrees and a volume resistivity are [ the primary imprint rollers 9, 10, 11, and 12 ] 105. It is a low resistance roller below omegacm. The secondary imprint roller 18 is installed in the secondary imprint opposite roller 7 (middle imprint belt 5) free [ attachment and detachment ].

[0009] Next, the image formation actuation by this image formation equipment is explained.

[0010] First, after carrying out the rotation drive of the photoconductor drum 1a of the image formation unit 1 and charging the front face in negative polarity uniformly with the electrification vessel 30, an aligner 31 performs image exposure according to the image information of black, and an electrostatic latent image is formed. And by the development sleeve 33 of a developer 32, the toner t of negative polarity is made to adhere to said electrostatic latent image by the reversal development, and a visible image is formed as a toner image of black.

[0011] The primary toner image of this black is imprinted on the rotating middle imprint belt 5 with the primary imprint roller 9 with which the primary imprint bias of straight polarity was impressed in the primary imprint nip section N. The primary transfer residual toner which remains on photoconductor drum 1a after a primary imprint fails to be scratched by the primary imprint cleaning blade 34, and are collected by the waste toner bottle 35.

[0012] The middle imprint belt 5 with which the toner image of black was imprinted rotates to the image formation unit 2 side. Also in photoconductor drum 2a of the image formation unit 2, the toner image of said Magenta formed similarly piles up on the toner image of the black on the middle imprint belt 5, and is imprinted in the primary imprint nip section N.

[0013] Hereafter, you make it pile up each other's cyanogen and toner image of yellow which were formed by the photoconductor drums 3a and 4a of the image formation units 3 and 4 on the black by which the superposition imprint was similarly carried out on the middle imprint belt 5, and the toner image of a Magenta one by one, and a full color toner image is formed on the middle imprint belt 5. And the secondary imprint roller 18 and the secondary imprint opposite roller 7 which impressed touch-down or suitable bias to the tooth back on the imprint material P front face conveyed by the secondary imprint nip section M between the middle imprint belts 5 are used as a counterelectrode to predetermined timing, a full color toner image bundles up with the secondary imprint roller 18 with which the imprint bias of straight polarity was impressed, and the 2nd order is imprinted.

[0014] The secondary transfer residual toner which remains on the middle imprint belt 5 after a secondary imprint fails to be scratched by the secondary imprint cleaning blade 20, and are collected by the waste toner bottle 21. Moreover, the middle imprint belt 5 is discharged with the electric discharge vessel 17 after a secondary imprint, and the next image formation actuation is equipped with it.

[0015] The imprint material P in which the full color toner image was formed is discharged outside, after being conveyed by the anchorage device (un-illustrating) and carrying out heat fixing.

[0016]

[Problem(s) to be Solved by the Invention] By the way, like the above-mentioned conventional image formation equipment, when the primary imprint rollers 9, 10, 11, and 12 are used as an impression member of primary imprint bias, as shown in drawing 7 (drawing image formation unit 1), the electric field E by primary imprint bias act in the range large to the outside near [ which contacts photoconductor drum 1a ] the primary imprint nip section N. Moreover, since the primary imprint roller 9 separates from the rear face of the middle imprint belt 5 gradually, it becomes easy to generate exfoliation discharge between the rear faces of the middle imprint belt 5. For this reason, according to generating of this exfoliation discharge, the toner image formed on the middle imprint belt 5 is disturbed, and partially, a toner image will turn into a poor image, such as condensation or the lost so-called dot image, and a TORIASHI image, and will appear.

[0017] Furthermore, this electric field E act also in the opening which photoconductor drum 1a and middle imprint belt 5 front face divide into an acting [ the electric field E by the primary imprint bias to the primary imprint roller 9 / in the large range ]-out of the primary imprint nip section N sake. For this reason, abnormality discharge in this opening is promoted by this electric field E, the location where this abnormality discharge broke out differs in imprint effectiveness from the location which did not occur, and this will become a poor image, such as the so-called rough skin image, and will appear.

[0018] Moreover, when the primary imprint rollers 9, 10, 11, and 12 are used as an impression member of primary imprint bias, as shown in drawing 7 (drawing image formation unit 1), it is necessary like the above-mentioned conventional image formation equipment to press the primary imprint roller 9 by the predetermined energization force to photoconductor drum 1a by the primary imprint nip section N, and to obtain the nip width of face of extent. Therefore, a toner condenses in the primary imprint nip section N, and it becomes easy to generate the so-called inside omission image.

[0019] Then, this invention prevents generating of exfoliation discharge near the primary imprint nip section, or abnormality discharge, and makes light the press between the primary imprint bias impression member in the primary imprint nip section, and a photoconductor drum, and aims at offering the image formation equipment which can obtain a good image without a poor image.

[0020]

[Means for Solving the Problem] In order to attain the above-mentioned purpose, this invention imprints the primary toner image formed on image support to an endless-like middle imprint belt in the primary imprint sections. In the image formation equipment which imprints the 2nd order of said toner image on this middle imprint belt to imprint material in the secondary imprint sections, and performs image formation in contact with the tooth-back side of said middle imprint belt, this middle imprint hair side of belt side is contacted to said image support in said primary imprint sections. It has a primary imprint bias impression member for impressing primary imprint bias to said middle imprint belt. Said primary imprint bias impression memberThe volume resistivity is characterized by the plate-like part material which has elasticity or sheet-like members by which resistance adjustment was carried out being consisted of by 101-1012-ohmcm.

[0021] Moreover, the surface electrical resistance by the side of the tooth back of said middle imprint belt which contacts said primary imprint bias impression member is 108. Image formation equipment according to claim 1 characterized by what is been more than omega\*\*.

[0022] Sequential formation of the toner image of two or more colors is carried out on said one image support, primary imprint bias is impressed to said primary imprint bias impression member in the primary imprint sections, and the primary toner image of said two or more colors is imprinted one by one on said middle imprint belt. Moreover, superposition, It is characterized by putting in block the piled-up toner image of said two or more colors in the secondary imprint sections, and imprinting the 2nd order to imprint material.

[0023] Moreover, said image support which supports the electrostatic latent image of the color of the arbitration according to image information on a front face, It has two or more image formation units equipped with a development means to develop said electrostatic latent image as a toner image, at least. Arrange said each image support of each of said image formation unit to a single tier, and said each image support is made to contact said middle imprint hair side of belt side in the primary imprint sections, respectively. Impress primary imprint bias to said primary imprint bias impression member in said primary imprint sections of each of said image support, pile up the toner image of a different color formed.in said each image support, respectively one by one on said middle imprint belt, and it is imprinted the 1st [ in all ] order. It is characterized by putting in block the toner image of two or more colors piled up in the secondary imprint sections, and imprinting the 2nd order to imprint material.

[0024]

[Embodiment of the Invention] Hereafter, the gestalt of operation of this invention is explained based on a drawing.

[0025] <Gestalt 1 of operation> Drawing 1 is the outline block diagram showing the image formation equipment concerning the gestalt 1 of operation of this invention. In addition, the same sign is given to the same member as the image formation equipment of the conventional example shown in drawing 5, and the overlapping explanation is omitted.

[0026] The image formation equipment of the configuration and image formation actuation of those other than a primary imprint member of the gestalt of this operation is the same as the image formation equipment of the conventional example shown in drawing 5, and explains only a primary imprint bias impression member with the gestalt of this operation.

[0027] With the gestalt of this operation, the tabular imprint blades 40, 41, 42, and 43 which have elasticity as a each primary imprint bias impression member of the image formation units 1, 2, 3, and 4 were used.

[0028] The imprint blades 40, 41, 42, and 43 are a volume resistivity 108 Blades of HIDORINGOMU with a thickness of about 2mm which carried out resistance adjustment are consisted of by omegacm extent. As each imprint blades 40, 41, 42, and 43 are shown in drawing 2 (drawing imprint blade 40 of the image formation unit 1), it has fixed to the L character set iron 44 with the adhesives which

carried out electric conduction processing, and the primary imprint bias power supply 13 is connected to the L character set iron 44. The primary imprint bias power supply 13 impresses the imprint bias of straight polarity to the L character set iron 44 with the gestalt of this operation.

[0029] Moreover, with the gestalt of this operation, the volume resistivity uses the resin film of polyimide which adjusted the surface electrical resistance of about 1013ohmcm and a tooth back (primary imprint bias impression side) to 1011ohm\*\* extent by 100 micrometers in the perimeter of 400mm, and thickness as a middle imprint belt 5. That is, in order to form surface potential which holds a toner on the middle imprint belt 5 in order to suppress toner spilling in the time of a primary imprint, resistance used the higher middle imprint belt 5.

[0030] Therefore, in order to acquire sufficient primary imprint current, it is necessary to impress higher primary imprint bias. It was made to impress the electrical potential difference of 1kV to each imprint blades 40, 41, 42, and 43 in the gestalt of this operation from the each primary imprint bias power supply 13, 14, 15, and 16 (V, the exposure section: the non-exposing section: potential of each photoconductor drums 1a, 2a, 3a, and 4a at this time, -600 -200 V). Therefore, it is easy to generate discharge in the opening near the primary imprint nip section N.

[0031] With the gestalt of this operation, however, by having used the tabular imprint blades 40, 41, 42, and 43 as a primary imprint bias impression memberSince it becomes the configuration which approaches rapidly to the middle imprint belt 5 which the imprint blade 40 rotates in the primary imprint nip section N at the time of the primary imprint of a toner image, and is left rapidly as shown in drawing 3 (drawing imprint blade 40 of the image formation unit 1)Compared with the case of the imprint roller (refer to drawing 7) of the above-mentioned conventional example, the range where the electric field E by primary imprint bias act becomes narrow.

[0032] For this reason, promotion of abnormality discharge in the opening between photoconductor drum 1a and the middle imprint belts 5 could be suppressed, and generating of a poor image, such as the so-called rough skin image, has been prevented. [ / near the primary imprint nip section N ]

[0033] Moreover, as shown in drawing 3, compared with the case of the imprint roller (refer to drawing 7) of the above-mentioned conventional example, the range to which exfoliation discharge takes place between the imprint blade 40 and the middle imprint belt 5 also becomes narrow by approaching rapidly to the middle imprint belt 5 which the imprint blade 40 rotates in the primary imprint nip section N at the time of the primary imprint of a toner image, and separating rapidly.

[0034] For this reason, the toner image has prevented generating of a poor image, such as condensation or the lost so-called dot image, and a TORIASHI image, partially.

[0035] Moreover, this resistance is 108, although surface electrical resistance on the back (primary imprint bias impression side) used what is 1011ohm\*\* extent as a middle imprint belt 5 with the gestalt of this operation as mentioned above. If it becomes below omega\*\*, it will become primary imprint bias and this potential in the to some extent large range of middle imprint belt 5 tooth back by the side of primary imprint bias impression (the imprint blade 40, 41, and 42 side, 43 sides). Consequently, since it acts on the range where the electric field formed of the primary imprint bias impressed to the imprint blades 40, 41, 42, and 43 are large, the effectiveness of this invention mentioned above will fade.

[0036] Therefore, it is the surface electrical resistance of middle imprint belt 5 tooth back by the side of primary imprint bias impression like the gestalt of this operation 108 The effectiveness of this invention is heightened by carrying out to more than omega\*\*. In addition, the value which impressed and measured 100V with the high ohm-meter (the product made from ADVANTEST; R8340) was normalized and used for the surface-electrical-resistance value of middle imprint

belt 5 tooth back by the side of the above-mentioned primary imprint bias impression using the measurement probe based on the JIS method K6911.

[0037] Moreover, a volume resistivity is 108 as mentioned above as imprint PUREDO 40, 41, 42, and 43 with the gestalt of this operation. Although what is omega<sup>acm</sup> extent was used, if the volume resistivity of the imprint blades 40, 41, 42, and 43 becomes more than 1012-ohmcm, primary imprint electrical potential differences required in order to secure sufficient primary imprint current will become a very high value. Consequently, since an expensive transformer and the cure against leak are needed, the cost rise of equipment will be caused.

[0038] Therefore, an expensive transformer and the cure against leak can suppress the cost rise of equipment in needlessness by using that whose volume resistivity of the imprint blades 40, 41, 42, and 43 is 101-1012-ohmcm like the gestalt of this operation.

[0039] Thus, with the gestalt of this operation, by using the tabular imprint blades 40, 41, 42, and 43 whose volume resistivities are 101-1012-ohmcm as a primary imprint bias impression member, generating of abnormality discharge near the primary imprint nip section N or exfoliation discharge can be suppressed, generating of a poor image (a rough skin image, a dot image, a TORIASHI image, etc.) can be prevented, and a quality image can be obtained.

[0040] <Gestalt 2 of operation> As the gestalt of this operation shows to drawing 4 as each primary imprint bias impression member of the image formation units 1, 2, 3, and 4, it is a configuration using the conductive imprint sheet 45 which is about 0.5mm or less in thickness, and does not have rigidity, and other configurations and image formation actuation are the same as that of the conventional example shown in drawing 5, and the image formation equipment of the gestalt 1 of operation shown in drawing 1. In addition, the same sign is given to the same member as drawing 1 and the image formation equipment of the gestalt 1 of operation shown in 2, and the overlapping explanation is omitted.

[0041] As an imprint sheet 45, a PBT (polybutylene terephthalate) elastomer, a styrene system elastomer, or PVdF and PES (polyether sulfone) that carried out resistance adjustment can be used, for example. Moreover, also in the gestalt of this operation, resistance adjustment of the volume resistivity is carried out by the imprint sheet 45 like the gestalt 1 of operation at 101-1012-ohmcm.

[0042] As each imprint sheet 45 is shown in drawing 4 (drawing imprint sheet 45 of the image formation unit 1), it has fixed to the L character set iron 44 with the adhesives which carried out electric conduction processing, and the primary imprint bias power supply 13 is connected to the L character set iron 44. The primary imprint bias power supply 13 impresses the imprint bias of straight polarity to the L character set iron 44 with the gestalt of this operation.

[0043] Moreover, for the middle imprint belt 5, it sets in the gestalt of this operation as well as the gestalt 1 of operation, and surface electrical resistance is 108. The thing more than omega\*\* was used.

[0044] Although the point of the imprint sheet 45 which does not have rigidity in the primary imprint nip section contacts a photoconductor drum with the gestalt of the gestalt of this operation, the contact pressure at this time is about 5 g/cm.

[0045] On the other hand, in the case of the imprint roller (refer to drawing 7) of the above-mentioned conventional example, in order to make an imprint roller contact homogeneity at a photoconductor drum, the contact pressure to a photoconductor drum becomes high with the both ends to a spring etc. about an imprint roller at a \*\*\*\*\* sake. Therefore, although it is promoted and is easy to carry out extraction injury generating of the toner pseudo-\*\* in the primary imprint nip section, since contact pressure to a photoconductor drum is small made by having used the imprint sheet 45 with the gestalt of this operation as mentioned above, the inside omission of the toner image in the primary imprint nip section etc. can be prevented.

[0046] Thus, with the gestalt of this operation, in addition to the effectiveness acquired with the gestalt 1 of operation, the inside omission of the toner image in the primary imprint nip section etc. can be prevented, and a quality image can be obtained.

[0047] Moreover, although it was the configuration which forms a toner image in order of black, a Magenta, cyanogen, and yellow by the image formation units 1, 2, 3, and 4, the order of arrangement of the image formation units 1, 2, 3, and 4 is replaced, and you may make it pile up the toner image of each color one by one with the gestalt of each operation mentioned above.

[0048] Moreover, although it was image formation equipment equipped with two or more image formation units 1, 2, 3, and 4 with the gestalt of each operation mentioned aboveBesides this, for example, the toner image of two or more colors by which sequential formation is carried out on one photoconductor drumThis invention is applicable also to the primary imprint bias impression member of the image formation equipment which piles up in the primary imprint nip section, imprints the 1st order, bundles up in the secondary imprint nip section, imprints the 2nd order, and obtains a color picture.

[0049]

[Effect of the Invention] As explained above, when the volume resistivity consisted of plate-like part material by which resistance adjustment was carried out in the primary imprint bias impression member at 101-1012-ohmcm according to this invention and in which it has elasticity, or a sheet-like memberSince it becomes possible to make narrower than the case of the conventional imprint roller the range where the electric field by the primary imprint bias in the primary imprint sections act, generating of exfoliation discharge near the primary imprint sections or abnormality discharge can be prevented, and a quality image without a poor image can be obtained.

#### DESCRIPTION OF DRAWINGS

##### [Brief Description of the Drawings]

[Drawing 1] The outline block diagram showing the image formation equipment concerning the gestalt 1 of operation of this invention.

[Drawing 2] The side elevation showing the imprint blade of the image formation equipment concerning the gestalt 1 of operation.

[Drawing 3] Drawing in which it is shown near the primary imprint nip section at the time of the primary imprint of the image formation equipment concerning the gestalt 1 of operation.

[Drawing 4] The side elevation showing the imprint sheet of the image formation equipment concerning the gestalt 2 of operation.

[Drawing 5] The outline block diagram showing the image formation equipment in the conventional example.

[Drawing 6] The outline block diagram showing the image formation unit of the image formation equipment in the conventional example.

[Drawing 7] Drawing in which it is shown near the primary imprint nip section at the time of the primary imprint of the image formation equipment of the conventional example.

##### [Description of Notations]

1, 2, 3, 4 Image formation unit

1a, 2a, 3a, 4a Photoconductor drum (image support)

5 Imprint Belt

13, 14, 15, 16 Primary imprint bias power supply

18 Secondary Imprint Roller

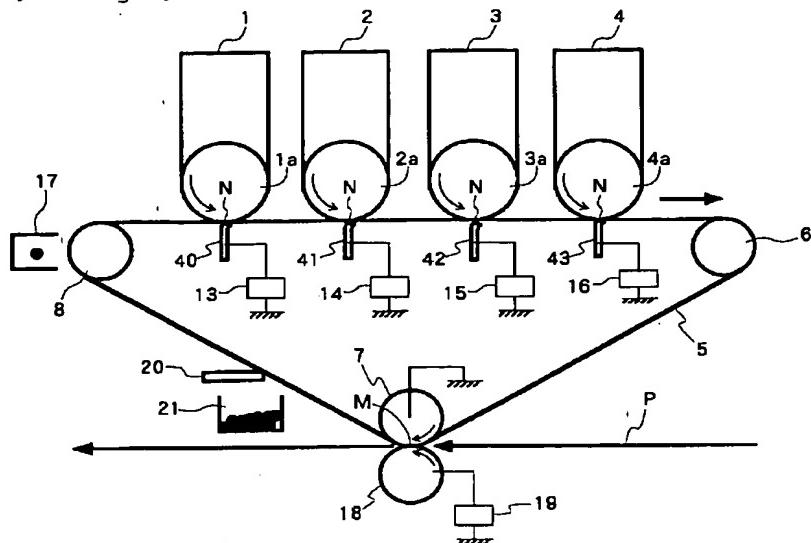
40, 41, 42, 43 Imprint blade (primary imprint bias impression member)

44 L Character Set Iron

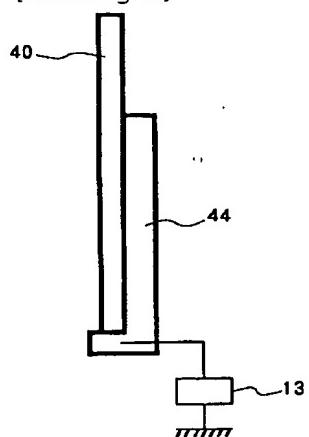
45 Imprint Sheet (Primary Imprint Bias Impression Member)

## DRAWINGS

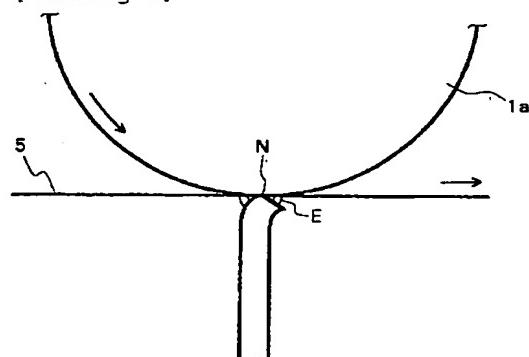
[Drawing 1]



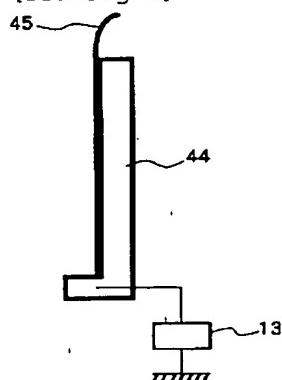
[Drawing 2]



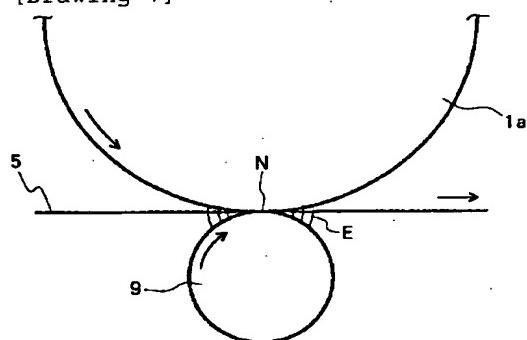
[Drawing 3]



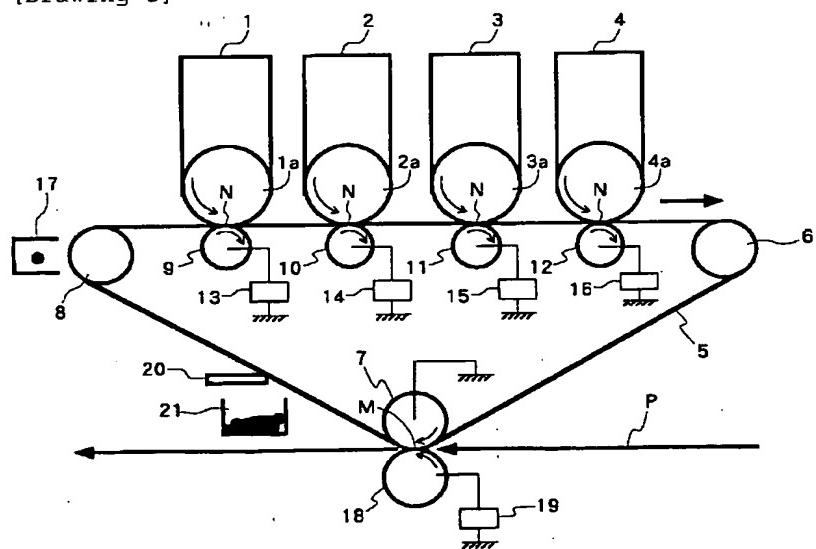
[Drawing 4]



[Drawing 7]



[Drawing 5]



[Drawing 6]

